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TECHNICAL PROGRESS AND GROWTH OF LABOR PRODUCTIVITY
II. USSR INDUSTRY

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A. Potkin

Steady growth of labor productivity is an economic law of socialism. Its very great significance in the building of Communism has been proved by Soviet experience. Thus, in the postwar period, approximately 75 percent of the increase in the physical volume of the national income of the USSR was achieved through the growth of socialist labor productivity. Two thirds of the average annual increase in production in USSR industry in the postwar period has been achieved through the growth of labor productivity in old and new enterprises. Socialist society steadily increases labor productivity in all fields of the national economy and provides for the uninterrupted growth of the national income and of the output of producer and consumer goods both absolutely and per capita. On this basis the process of socialist accumulation and the raising of the material and cultural standard of living of the population is realized, and the conditions for the transition from a socialist society to Communism are prepared.

Not only theory, but also historical experience shows that under socialism there is the possibility of raising labor productivity with much greater speed than under capitalism. For the period 1933-1953, the yearly output of industrial workers of the USSR increased sixfold. For the same period in US industry, the yearly output of the workers rose less than 50 percent. Even in postwar years, when the USSR had to expend much effort in the restoration of the national economy, annual industrial output per worker exceeded its prewar level by an amount far greater than in the US.

Annual Output of USSR and US Industrial Workers

(in \$ of 1940)

<u>Year</u>	<u>USSR</u>	<u>US</u>
1940	200.0	100.0
1950	1200.0	122.4
1953	1210.0	131.0

The advantages of socialism make it possible for Soviet industry to achieve an increase in worker output much more rapidly than US industry. However, the success of Soviet industry in increasing worker output does not mean that it is utilizing all the opportunities which exist for the increase of labor productivity. The following facts are evidence of this. First, according to the schedule of the Fifth Five-Year Plan, labor productivity in USSR industry was to have been raised 50 percent. In fact, it was raised 40 percent, by virtue of which the fulfillment and even overfulfillment of production work quotas was achieved to a greater degree than was expected by the plan to result from an increase in the number of workers. Second, in some branches of industry (coal, timber, and cotton), the prewar level of output per worker was hardly exceeded at all, although in the development of technology and such industries as coal and timber a large amount of resources were invested. Third, there are great lags in output per worker in enterprises of the

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same industry. Fourth, Soviet industry, occupying the foremost place in Europe, still yields to American industry with respect to the level of worker output. A study of the problem in some branches of industry has shown that this difference in the level of output cannot be related solely to differences in the intensity of labor, and that Soviet industry still is not utilizing sufficiently the achievements of science, technology, and the organization of production.

In Soviet industry there are enormous possibilities for increasing labor productivity both by means of the further development of technology and specialization of production and through mobilization of available reserves. Utilizing these possibilities, Soviet industry could carry first place in the world with respect to the level of labor productivity.

Socialist production relations open up a very wide area for developing the technology of heavy machine building. Under socialism, technical progress serves as the means of saving and facilitating labor and ensuring the continuous growth of production in the interests of satisfying national needs. The struggle for technical progress, for the first time in history, is becoming a national matter. It is realized systematically and regularly, whereas under capitalism, during crises, investments in technology are reduced and output of producer goods curtailed.

The Communist Party and the Soviet government are ensuring technical progress in industry, construction, and agriculture by consistently putting into operation the law of the preferential growth of producer goods output and by carrying out the preferential development of heavy industry. In 1955, the output of producer goods in USSR industry increased to nearly 3.9 times that of 1940, and the output of consumer goods to nearly 2.2 times that of 1940. The preferential growth of producer goods output makes it possible to supply the national economy with new equipment and constantly increase the technical equipment and productivity of the worker and collective farmer. The higher the rate of development of heavy industry, the greater the possibility of technical progress and growth of labor productivity, as well as the development of the entire national economy.

The preferential growth of producer goods output has permitted the Communist Party and the Soviet state to conduct a large-scale technical reconstruction of Soviet industry on the basis of electrification. The work of machines has been almost completely electrified. During the last quarter century the electrical equipping of industrial workers of the USSR has been increased more than fivefold. During this period, it was raised twice as rapidly as in US industry. Electricity has been introduced in many technical processes. The level of mechanization of difficult and labor-consuming work has been raised sharply.

In the coal industry, the cutting, breaking down, delivery, and hauling of coal underground and the loading of coal into railway cars have been almost completely mechanized. Compressor and ice-water methods for the extraction of petroleum have been widely introduced. In oil enterprises of the Ministry of Electric Power Stations engaged in the extraction, drying, and harvesting of peat the processes have been successfully mechanized; and in the timber industry, the felling, transport, loading, and removal of timber have been mechanized. In the iron-ore industry, the mechanization of the processes of boring, breaking down, filling operations, and loading of ore into railway cars have been, on the whole, mechanized. In ferrous metallurgy, pouring of cast iron and loading of blast furnaces have been completely mechanized. The technical progress taking place in Soviet industry is being manifested not only in the original replacement of manual labor mechanisms, but also in the further development and utilization of machine technology and in the introduction of new kinds of mechanisms and of new kinds of material and power.

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High-speed technology and high-speed production processes are being introduced on a large scale. Complex mechanization and automation of production are being carried out and electronics is being introduced. Industrial utilization of atomic energy for peaceful purposes has begun.

However, Soviet industry still is not utilizing sufficiently the possibilities of modern technology for raising labor productivity. To ensure the further rapid growth of labor productivity, it is necessary, along with the mobilization of the available reserves of production, to eliminate serious deficiencies in the technological development of Soviet industry.

Machine building is the main basis for the technological development of industry and of the entire national economy. Soviet machine building has begun to cope with a vast quantity of new kinds and designs of machines and mechanisms which have furthered and are furthering the technical progress of the entire economy of the USSR. At present [December 1955], Soviet machine building is turning out thousands of types of modern machine tools, automatic lines of machine tools, powerful pneumatic casting machines for casting under pressure and centrifugal casting, powerful hydro-steam turbines, coal combines, oil drilling plants for deep drilling, blooming mills, and other very complex metallurgical equipment, tractors, combines, excavators and dump trucks, powerful locomotives, motor vehicles, very complex equipment for creating atomic energy, reactive engines, etc.

Soviet machine building has shown its ability to create and master all machines necessary for the national economy and for defense. It is all the more inadmissible that part of the output of Soviet machine building plants is lagging behind the demands of modern science and technology and the demands of the Soviet socialist economy.

This disparity is revealed in a number of facts. First, some machine building plants continue to turn out different kinds of obsolete technical equipment at a time when there exist in the USSR and abroad more modern and economical machine designs. For example, although designs for diesels with a new cooling system are available, the "Dvigatel Revolyutsii" Plant is producing less economical diesels of antiquated design. The iron and steel industry of Krivoyarsk until now has been supplied with inefficient scraper winches of IA-10 and LDM model types manufactured by the "Kommunist" Plant and the Debal'tsevo Machine Construction Plant which have been obsolete for 30 years. The Soviet textile industry is frequently supplied with obsolete machines, while abroad more modern designs of automatic looms and new designs of automatic aggregates for continuous bleaching, dyeing, and finishing of textiles, with an industrial cycle shortened by five sixths to six sevenths, are being turned out. The Ural Motor Vehicle Plant is producing 3-ton trucks from a 1933 design. Sometimes even the progressive plants assimilate new designs slowly and yield superiority to foreign firms.

The production of technical equipment which has become obsolete and the lag of machine production behind the demands of modern science and technology are hindering the growth of labor productivity. Mass production of obsolete equipment is causing particularly great damage in this respect. In its time, this technical equipment was new and promoted an increase in labor productivity. But when it became standard in a given field and the maximum possible level of the worker output in the mass application of it was reached, it exhausted its ability to promote a further significant rise in labor productivity. The invention of more economical machines makes the release of machines which are obsolete (ustarevshyye) uneconomical for socialist society.

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Second, an essential defect in the work of a number of branches of machine building which are turning out new technical equipment is their lag behind the needs of the national economy with regard to quantity. The most productive machines, and especially machines of new designs, are still produced in comparatively small quantities. In the postwar period, the manufacture of lathes has increased to approximately 2.5 times that of 1940 and the manufacture of turret lathes to only 1.3 times that of 1940. The manufacture of complex automatic line tools, special aggregate machines and high precision instruments for the automation of industrial processes, is still small. The manufacture of modern stamping and forging equipment is extremely inadequate. The insufficient rate of manufacture of small industrial equipment is greatly hindering the growth of labor productivity. This equipment can become the basis of a large-scale growth of labor productivity only if its application is not restricted to separate sections of enterprises and, also, to individual enterprises. On the other hand, the transition to an extensive output of more efficient equipment is often so prolonged that it begins to grow technically obsolete.

Third, in working out plans for the manufacture of machinery, including machines of new design, the actual needs of the branches--the users of the machines and the conditions in which the machines will operate--are not always taken into consideration. Thus, an iron and steel enterprise is often equipped with machines and mechanisms which do not correspond to modern management requirements of mining works and which do not ensure, accordingly, a high productivity (for example, perforators PA-23 and PR-35 assembled in air-supporting columns, telescope perforators PR-51 and PR-30, and loading machines of type PML-5, etc.). For a number of years the timber industry was provided with tractor KT-12, which has low horsepower and gives low productivity under timber cutting conditions. The Gorlovka Machine Building Plant is producing coal combines not only for the mines of the Donets Coal Basin, but also for other coal fields. But in the conditions, for example, of the Kuznets Coal Basin, the motor power and the height of the cutting arm of the combine prove insufficient; therefore, it becomes necessary to "complete" the design of a combine on the job which, together with additional expenditures, also reduces the economic efficiency of the combine. To eliminate this defect it is important to strengthen the role of the consuming industries in planning the kinds of machines in machine building.

Fourth, in the designing of new machines and in their manufacture in many cases not enough attention is given to their economy. Nevertheless, superior technical equipment, on the basis of which the continuous growth and perfection of socialist production is carried out, is not only an engineering concept, but also an economic one. Whether a given machine constitutes superior technical equipment is determined not only by its technical but also by its economical perfection. The saving of social labor by means of machinery is seen in the fact that in the use of a machine, more current labor (and in some cases, past labor in the form of raw material, fuel, etc.) is saved than the additional labor required in their manufacture, including additional expenditures for repairs and other auxiliary operations.

The new and latest technical equipment is a means for saving not only current labor but also equipment, work space, raw materials, fuel, and other materials. For example, the automation of rolling mills permits an increase in their productivity of approximately 15 percent. High-pressure turbines, created at the Leningrad Metallurgical Plant imeni Stalin, have ensured a 10-12-percent saving of fuel. New technical equipment is also a means of achieving higher-quality products and conformity to standards, and obtaining entirely new products. In some cases, to attain higher-quality products additional expenditures are necessary; for example, for the enrichment of raw material and fuel. But as a result, subsequent manufacturing procedures

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(for example, in metallurgy) require a smaller outlay in the processing of raw material and fuel, and the productivity of equipment and labor is increased. The total outlay on production is reduced. This circumstance should also be considered in estimating the economy of the corresponding technical equipment.

The output of superior industrial equipment should ensure a considerable reduction of outlays for the manufacture of a given product relative to socially necessary expenditures. In each branch and in a given period, the socially necessary outlay is the expenditure required to produce the bulk of a given product. The designing of new technical equipment should not be based on the necessity of achieving economy relative to these expenditures alone. Technical equipment being designed now should be better than that used at present in the best enterprises. Thus, the technical equipment turned out currently should be more economical than not only the "average" but the best technical equipment in present use. Only then will it promote the greatest possible reduction of the socially necessary cost of production, i.e., become actually superior technical equipment.

The economy of a machine is expressed in the entire number of physical and value indexes, i.e., technical and economic indicators (in higher coefficients of use of equipment, in a reduction of the relative expenditures of raw material, fuel, electric power, steam, and water; in a reduction of the number of workers; in a rise of labor productivity; in a reduction of production cost; in the time required for the additional investment to pay for itself; etc.). A correct calculation of the economic perfection of a new machine design often indicates the most advantageous path of technical progress for the national economy and helps to design and set up mass production of the most efficient machines and machine systems and overcome conservatism and complacency in the field of technical progress. The output of inefficient machines is possible only in cases where machine building plants fail to take into sufficient consideration the economics of the consuming industry; and the users are often forced (by the lack of other more productive machines) to accept any machine or to introduce ineffective systems of mechanization.

The example of the timber industry shows how economics necessitates a search for new solutions to problems of mechanization. In the timber industry, powerful mobile electric power stations were introduced as a power basis for mechanization. Their positive role was to pave the way for the electrification of the industry. However, expenditures on electric power received from these electric power stations constitute 20 percent of the cost of timber cutting. The number of auxiliary workers has increased. Therefore, the benzine-motor saw "Druzhba" has proved far more effective than the electric saw. The economy of the electric saw increases significantly only in the case of centrally supplied, cheaper electricity for timber cutting.

The problems of the economic efficiency of new technical equipment should occupy an appropriate place in the vast creative work in the field of technical progress which is always expanding in the USSR. The production of isolated elements of mechanization does not yield sufficient results in raising social labor productivity in industry as a whole. In many industries, a considerable amount of labor is not mechanized or is mechanized to an insufficient extent. Despite the progress toward mechanization of production in the USSR, the proportion of manual labor is still high. In the logging industry, 80 percent of the workers are engaged in manual labor; in the coal industry, 44 percent (including manual laborers who work with machines, more than 55 percent); in construction, 69 percent; in ferrous metallurgy, 35 percent; and in some branches of machine construction, more than 70 percent. Even in such a progressive plant as the Kirov, manual operations constitute 60 percent of the total work performed on manufactured articles in mechanical assembly shops.

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In a number of branches of industry, the percentage of manual workers is high as the result of poor mechanization of auxiliary processes as a whole and, above all, of the auxiliary assembly shops. In the largest metallurgical combines, less than half of all the workers are employed in the main assembly shops, while more than half are employed in auxiliary assembly shops. Mechanization of the main industrial assembly shops even on a high level is still not sufficiently effective if the work in auxiliary assembly shops is not mechanized or is poorly mechanized. Mechanization of main operations often is accompanied by a growth in the volume of auxiliary and preparatory operations if they remain unmechanized or poorly mechanized. In the logging industry in the postwar period, when intensive mechanization of the main processes of timber cutting took place, the proportion of auxiliary and preparatory operations in the total of labor expenditures (without rafting, tie saving, and other operations) was raised from 31 percent in 1948 to 45 percent in 1953. Consequently, because of the relatively significant growth of the workers' output in main operations (39 percent in logging, 45 percent in hauling, and 63 percent in removal), the output per registered worker in timber cutting was increased 14 percent altogether.

In a number of industries, together with the mechanization of labor, the number of manual workers servicing machinery is growing. In the coal industry they constitute more than one fifth of all workers. In machine building, machine time is often shortened and its proportion in labor expenditures is reduced as the result of the introduction of high-speed processes; but the percentage of auxiliary manual labor is increased.

The continuing high proportion of manual labor in total current labor expenditures is greatly hindering the growth of labor productivity in the USSR. At present, the task of complete, complex mechanization of labor, i.e. of equipping all kinds of labor in industry with machines, mechanisms, and appliances, faces Soviet machine building. In this connection, the index of complete mechanization which is usually used in the USSR should be reviewed. Even 100 percent mechanization of the main operations and processes of production in a given industry still does not indicate that all workers have been equipped with machines, since there is a large amount of manual labor used in connection with mechanisms and in auxiliary operations. The most accurate index of the level of labor mechanization is the ratio of mechanized labor to manual labor at both the industry and enterprise level, and in all subsequent operations and processes of production.

Complex mechanization of all types of labor is of paramount importance in the growth of labor productivity in USSR industry. The experience of Soviet industry shows that mechanization has a maximum economic effect when a machine system is created to include all steps and operations involved in production. In the mines, when a coal combine is used in conjunction with a low-powered although mechanized transportation system, there is a delay in removing the coal, and the combines and the workers operating them stand idle. Thus, labor productivity is not sufficiently increased. Soviet machine building should create complete complex systems of machines which are fully coordinated with each other in terms of technical quality and power, and which permit mechanization of all kinds of labor on a high level. This will create a technical basis for a sharp rise in labor productivity of Soviet industry.

Very critical problems face machine building in the manufacture of automatic technical equipment for industry and especially of equipment for the complex, centrally controlled automation of production.

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Complex mechanization is the attainment of that stage in the development of machine technology in which all workers are equipped with machines, mechanisms, and instruments, and preparation for transition to automatic production are being made. In a machine system which functions and is controlled automatically, direct manual operations are eliminated and the entire process is reduced to adjustment of machines and control of the rate of production. Therefore, automation of production is very significant in the rise of labor productivity and the elevation of the cultural and technical level of all production workers to that of engineers and technicians.

The automatic machines produced by Soviet machine building are highly economical as a rule. By using automatic lathes instead of ordinary lathes, labor productivity is increased fourfold, and with automatic conveyor belts, it is increased eightfold to tenfold. But in a number of cases, their technical and economic indexes are significantly below those planned, and sometimes a reduction of cost is not ensured. Thus, in the manufacture of automobile pistons, some conveyor belts have not proved sufficiently effective. The great future for automatic technical equipment demands from machine builders increased attention in achieving its greatest economy; and it demands from the enterprises and branches using this technical equipment the creation of conditions in which this economy can be fully realized (for example, conditions of necessary specialization and mass production).

Electrification, complex mechanization and automation of industrial processes, introduction of the newest highly productive equipment and of electronics and radio technology, and the use of chemistry in production and atomic energy for peaceful purposes represent the main trends of technical progress in Soviet industry.

For technical progress and increased labor productivity in machine building, the increase in the manufacture of specialized aggregate machine tools, automatic lines, new types of general and specialized machine tools, precision instruments (of increased precision), modern foundry and forge-pressing equipment, and automatic devices which permit the reduction of heavy time and the automation of control by instruments are of very great importance.

Machine building should ensure completion of the mechanization of loading, transfer of conveyors, and other work. It should also ensure increased capacity of underground transport in coal mines; the output on the necessary scale, of modern equipment for open-pit and hydraulic coal extraction; the output of highly productive automatic rolling equipment for ferrous metallurgy and of new, powerful steam turbines with a capacity of 150,000, 200,000 and 300,000 kilowatts with high and extra-high steam parameters, which sharply increase the economy of thermal electric power stations; and the production of high-powered hydraulic turbines and of gas turbines, which have a great future in the power engineering of a number of branches of the national economy (in electric power stations, shipbuilding, metallurgy, and in the petroleum industry, etc.). One of the tasks of machine building is to increase the output of automatic looms, modern spinning equipment, and other modern equipment for the light and food industries.

Soviet machine building is making great strides in supplying Soviet labor with technical equipment. Overcoming the defects in machine building which were revealed by the party will further promote its leading role in the rise of the entire national economy. Moreover, the struggle against elements of technical conservatism and underestimation of the requirements of a socialist economy should clear the road for further technical progress, which will be realized on the basis of the newest kinds of technical equipment and, especially, atomic energy.

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Technical progress in industry depends not only on machine building, but also on a number of other branches of heavy industry. Thus, the manufacture of new kinds of extrusion, tools of high density and chemical stability, which make it possible to manufacture machines for work under conditions of high temperatures and pressures, is very important for technical progress and the rise of labor productivity. The output of economical, contour rolled iron should lead to a sharp reduction of metal fractures in machine building, and thus to a reduction of labor expenditures in assembling, transporting, and remounting of articles, etc., and to an increase in labor productivity.

Designing, scientific research, and training organizations bear a great share of the responsibility for the solution of technical equipment. Accomplished Soviet designers have great responsibility for the technical progress of all branches of the national economy. However, in their work there is evidence of a certain conservatism and a closed attitude toward the achievements of both Soviet and foreign science and technology. In particular, they frequently fail to take into account the contradictory nature of capitalist technological development, the demand of fixed capital and the introduction of new technology are sharply curtailed or discontinued at the time of crisis. The tendency toward technological stagnation is active in the epoch of imperialism. But this is one side of the process. The other side is that monopolies, producing the stagnation are forced, under pressure of competition and the struggle for maximum profits, to increase the manufacture of new machine models and new kinds of technical equipment. At the same time, monopolies, competing among themselves and for the sake of maximum profits, in certain periods and in a number of cases, are forced to develop improved technical equipment. In the epoch of imperialism the process is predominant and in some periods the other side, the tendency toward technological stagnation in the electrical equipment industry, is predominant. The overall increase in the electrical equipment industry during the period 1929-1933, and an increase of 10% during the period 1939-1952. Militarization of the economy played a significant role in accelerating the growth of electrical equipment.

Only by knowing well the state of technology in capitalist countries is it possible to secure that our technology will keep pace with capitalism. This knowledge is helpful, among other things, in the work of Soviet success. Very careful study and critical analysis of these achievements of technology and organization of production in capitalist countries which can be utilized under U.S.S.R. conditions in the introduction of new kinds of labor productivity, building equipment, and strengthening the scientific and technical capability of the country are necessary. The stagnation of science and technology should on no account lead to rejection of their achievements, but should not militate against the introduction of the new kinds of scientific inventions of Soviet science and technology, and the introduction of advanced equipment, or independent development of Soviet and U.S.S.R. technology, for without independent, intensive development of technology it is impossible to occupy the foremost position in world technology.

The adequate provision of information concerning scientific and technological achievements in the U.S.S.R., the foreign countries, and the capitalist countries, and to reveal it in the scientific and technical literature should further considerably the technical progress of Soviet industry.

The development of a system for the distribution of labor among the scientific institutions which work on the same problems of science and technology, and among the various scientific establishments, plant design offices, and laboratories is very important for technical progress. Experience shows that radical and highly significant improvements in industrial technology are impossible without the development of theoretical studies and the working out of scientific and technical problems of a fundamental nature. Some

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10 years were required for the development of modern physics before its discoveries could release atomic energy. On the whole, the institutes of the Academy of Sciences and also some large industrial institutions and large universities which have suitable specialists and laboratories should be engaged in the development of theoretical studies and the working out of long-range scientific and technical problems combined with radical changes in industrial production techniques and with the improvement of existing technical equipment. To relieve these institutions from secondary problems, provide them with information about production needs, and ensure their working out the most important problems from the point of view of the national economy, constant collaboration among all sections of scientific and research work in the USSR and their relation with production are necessary. The deliberate practical direction of even long-range scientific projects and their constant "commensurability" with the achievements of branch institutions and enterprises should accelerate these projects and the application of their results in practice. On the other hand, the activities of industrial scientific research institutions and plant laboratories, in providing for continuous daily technical progress in existing enterprises and those under construction, should be constantly enriched by the solution of important scientific and technical problems. This demands serious improvement of scientific research planning in the USSR.

During the years of the prewar 5-year plans, Soviet industry was provided with new technical equipment on a large scale. Thus, at the end of the Second Five-Year Plan, the fixed capital of enterprises which had been built or wholly reconstructed in the years of the First and Second Five-Year Plans constituted 84 percent of the total fixed productive capital of Soviet industry; in electric power stations, 94.3 percent; in the chemical industry, 97.2 percent; and in ferrous metallurgy, 97.8 percent. Of the stock of machine tools on hand on 1 January, 1953, more than 50 percent were produced during the years of the Second Five-Year Plan. The new equipment which was installed before the war in Soviet industrial enterprises was, as a rule, the most advanced technically for that time.

Soviet industry received the largest quantity of new equipment in the postwar period. From 1940 to 1953, its fixed capital more than doubled. The technical level of industrial production of the USSR is considerably higher than before the war. At the same time, in Soviet plants and factories, the proportion of "worn-out" (vostanovivshiesya), equipment which is now technically outdated has increased. This circumstance is undoubtedly holding back the growth of labor productivity in Soviet industry.

It should be taken into consideration that in the US and some other capitalist countries (mainly in connection with war and militarization of the economy), an essential renovation of equipment has taken place. In US machine building and a number of other branches, equipment was renovated with greatest concentration during the war years. After the war, the proportion of "worn-out" equipment increased, but it was lower than before the war. The present problem consists in renovating equipment to a greater degree than in capitalist countries by utilizing the advantages of socialism. Continuous renovation of equipment, as well as the maintenance of a high proportion of new equipment, is one of the most important prerequisites for technical progress and labor productivity.

Together with the age of equipment, an important index of the technological and economical quality of a machine is its productivity. In many machine building plants, there exist, along with machines which operate at 1,500-2,000 and more revolutions per minute, antiquated machines which operate at 250-400 rpm. These machines are, naturally, about one tenth as productive as the new machines, and the output of the workers operating these

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machines is lower by far. In machine building, there is an especially large proportion of "matured" and unproductive forge-pressing and foundry equipment. But to a very great extent the progress of machine building, which determines the level of the entire national economy, depends on the technical newness of metal working machines. Outdated equipment also exists in other branches of industry. In the textile industry, along with automatic looms, unproductive looms of outdated designs are widely used. It should be kept in mind that equipment which was installed at the beginning of the First Five-Year Plan is nearly a quarter of a century old, and the majority of it has become technically obsolete.

The July plenum of the Central Committee CPSU set the task of replacing the large quantity of "matured" and, from the point of view of modern technology, unproductive equipment in Soviet industry with new equipment. It is not simply a question of renewal of equipment, but of essential improvement in its technical quality and replacement of outdated machines with new ones embodying the latest achievements of science and technology. A controversy has been going on for many years among economists and engineers concerning the obsolescence (*moral'nyy iznos*) of equipment under socialism. The opinion has been voiced that one of the advantages of socialism is the possibility, in view of the absence of competition, of using technical equipment until it has been fully depreciated physically.

Competition and crises of overproduction, which make it necessary under capitalist conditions to replace outdated equipment when its use no longer results in the required profit at a given price level, are absent under socialism. However, under socialism, there are also economic conditions which necessitate the replacement of old techniques by superior equipment in existing enterprises. At a certain point in the development of industrial technology and economics, the techniques employed in each industry cease to be a sufficiently effective means of economizing, increasing production, and satisfying people's wants. The replacement of outdated machines with superior technical equipment is of paramount economic importance for a socialist society. This makes it possible to save social labor (taking into account the additional expenditure required for the manufacture and maintenance of the new equipment and the remaining value of old equipment), reduce the amount of socially necessary labor time, and increase production to the greatest extent. Such substitution accelerates the increase in the productivity of social labor. It is particularly advantageous economically in those cases where it makes possible a maximum reduction in the socially necessary expenditure of labor, and the obtaining of additional output with a minimum investment of capital. Thus, accounts in some branches of machine building show that the replacement of several thousand outdated machines with new ones can increase output by 15 percent. To obtain this same increase by the construction of new enterprises requires twice the capital investment. The replacement of only a few extremely antiquated machines with modern ones in the entire machine building industry should, considering the capital outlay required, make possible a great saving of labor and a large increase in productive power.

In the USSR, new, large enterprises are constantly being built. These enterprises, based on superior and new technological principles, result in large increases in the productivity of social labor and production for a number of years after their construction. At the same time, Soviet industry is faced with the task of realizing the potential growth of social labor productivity in existing enterprises by replacing antiquated technical equipment with new, more modern and productive equipment.

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The necessity of replacing old technical equipment should not be construed to mean that it is necessary to discard all antiquated equipment immediately. Some of the machinery can be modernized, and eventually, with its aid, the so fully necessary outlay of a given kind of product may be achieved.

Technical progress in manufacture does not mean only the introduction of new, superior equipment. It consists, also, in constant improvement of the technology of production. The experience of the development of Soviet industry shows that in a number of cases preservation of old production technology hinders the effective use of new kinds of equipment. Also, the absence of some kinds of equipment impedes introduction of progressive production technology.

At present, many kinds of technology have been created and have proven their economic efficiency which, if widely disseminated, should lead to a very considerable rise in social labor productivity. Thus, in machine construction, the substitution of free forging for drop forging makes possible a metal saving of 20-25 percent, as well as the manufacture of machine parts of more exact measurements, and requires less labor expenditure in their processing. Conversion from air-steam waste hammers in stamping to mechanical forging processes with electronic heating makes possible a 20-30-percent saving of metal and a reduction of 50-60 percent in subsequent mechanical processing. Cold heading of metal reduces its cost sometimes by the same amount, ensures the manufacture of machine parts to tolerances within 0.01 millimeter, and makes it possible to eliminate further mechanical processing completely. Complex reorganization of technology, which includes the entire field of production, should play a very great role in increasing the economic efficiency of new technical equipment.

The forms of production organization are very important in the introduction of the latest technical equipment and production technology. The introduction and effective use of automatic technical equipment are indissolubly connected with specialization in production, unification of technological processes, and standardization of products. The July plenum of the Central Committee of the CPSU brought to light very serious defects in production specialization in Soviet industry. Overcoming these shortcomings will make it possible to eliminate the contradiction between the level of modern technology and specialization in production, and will give wider range for the introduction of highly productive, specialized machines. In the coal industry, coal combines cannot be operated efficiently where the work has not been organized according to the schedule of the production cycle. Where work is carried on according to this schedule and the standard of the cycle is adhered to, labor productivity increases by one half.

This testifies to the organic relationship which exists between the perfection of technical equipment, technology, and production organization. The problems of technical progress and the increase in labor productivity in Soviet industry can be solved completely only by a recognition of this organic relation.

The most productive use of new technical equipment, as well as the introduction of superior forms of technology and production organization, depend above all on the people, on the cultural and technical level of specialists, the organization of labor, the development of socialist competition, and the dissemination of the experience of progressive enterprises and industrial innovators.

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In Soviet industry, vast experience has been accumulated in technological development, the introduction of advanced technology, the organization of production and labor, and the work of efficiency experts and industrial innovators. However, this experience is being poorly diffused and enlarged upon. The very successful trips of individual workers and engineers from one plant to another result in the exchange of progressive experience only on a small scale. Moreover, these visits are of a limited nature. It is necessary to improve radically the dissemination of progressive experience. The most important task of the State Committee for New Technology (Gostekhnika) and the ministries is the dissemination and introduction of valuable achievements which are suitable for a number of enterprises. Periodic consultations concerning individual kinds of production which would provide information on better and more efficient methods of production, a wider extension of interplant schools of progressive experience, and a higher level of scientific and technical information and propaganda are necessary.

Labor productivity and production cost planning should facilitate the mobilization of all reserves, the substitution of superior equipment for old technical equipment, and the utilization of progressive experience. Planned labor productivity and planned cost of production should take into account the introduction of new technical equipment, the perfection of production methods, and the improvement of labor organization. Such planning should stimulate enterprises and ministries to replace uneconomical equipment with more efficient and productive equipment, modernize outdated equipment, and introduce the most productive technical equipment, since such planning will bring to light the unprofitability of using obsolete and outdated equipment in enterprises, industries, and the economy as a whole.

Labor productivity and production cost planning which takes into account the achievements of modern technology requires drastic improvement in the fixing of labor norms. Empirical-statistical (opytno-statisticheskkiye) output norms are now in wide use in Soviet industry. These norms, as a rule, do not reflect the achievements of science and technology and are greatly exceeded by the workers. Output norms in machine building are exceeded by 60 to 80 percent; in metallurgy, by 35 percent; and in the chemical industry, by 40 percent. The unsound technological foundation of the norms is indicated by the fact that the time norms fixed for identical operations (for example, in machine building) often differ by 50 percent or more for the various enterprises of a given industry. Because of the gap formed during the postwar years between scheduled wage rates and actual earnings, the proportion of the former in actual earnings amounts to 70 percent or less, and many executives drop the output norms below those which are technically justified, in order to bring up earnings. As a result, labor and wage planning is not sufficiently utilized as an effective instrument of technical progress and increase in labor productivity.

Drastic improvement in technological planning is one of the most important conditions for mobilizing all reserves for the further growth of labor productivity in Soviet industry. This improvement can be achieved by organizing scientific work in industrial scientific institutions in working out well-founded norms, by expanding training and raising the qualifications of rate setters in enterprises, and by raising the average scheduled wage to the level of the average actual wage. These measures make it possible to tie labor and wage planning to technical progress, and promote the planning of labor productivity.

Material encouragement of the development and introduction of new technical equipment is very important. In enterprises, funds which are made up of deductions from planned and above-plan profits have been set aside mainly to provide a material stimulus for the introduction of new technical equipment. The problem consists in the proper utilization of these funds. The bonus systems existing in enterprises fail to encourage sufficiently great changes in technical

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equipment and production technology, which are associated with reorganization of production based on old techniques. The awarding of prizes to plant workers, design offices, plant laboratories, and scientific and research institutions which develop technical equipment and carry out the reorganization of production should be related to the economic effect obtained from the introduction of new technical equipment and the reorganization of production. Such a relationship increases the personal interest of workers in the introduction of the most effective technical equipment.

In Soviet industry the greatest opportunities exist for a rapid development of technology and labor productivity in the interests of further strengthening the economic and defensive capacity of the USSR and of increasing people's welfare, as well as for the swiftest solution of the economic problems of the USSR and of building a Communist society. It is necessary to utilize these opportunities to the fullest degree.

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